

Cheilosia fasciata (Diptera: Syrphidae) new to Denmark

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Bruun, H.H. & Bygebjerg, R.: *Cheilosia fasciata* (Diptera: Syrphidae) new to Denmark. [**Blomflugan *Cheilosia fasciata* funnen i Danmark.**] – Entomologisk Tidskrift 137(3): 131-135. Uppsala, Sweden 2016. ISSN 0013-886x.

We report the first records to Denmark of the hoverfly *Cheilosia fasciata* Schiner & Egger, 1853. The larvae live as leaf miners on *Allium ursinum* L. (ramsons). The mines are conspicuous and easily recorded. We first found larvae and mines in a forest on the island of Falster in south-eastern Denmark in 2014. Search for larvae and adults during the 2015 season across Denmark – assisted by numerous volunteers – resulted in a total of four inhabited forest sites, all on Falster and within a distance of 10 km. Thus, the species is most likely a recent immigrant from northern Germany. It will probably continue to spread in the years to come.

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The Danish syrphid fauna must be considered well known, thanks to extensive studies over the last half century, including a nationwide atlas survey (Torp 1984, 1994). Nevertheless, species not previously recorded are found every now and then (e.g. Bygebjerg 2007, Bygebjerg & Petersen 2009). This may at least in part be ascribed to colonization of the territory by southern species pushed by climate change. We describe an apparent example of this process, namely the recent finding of *Cheilosia fasciata* Schiner & Egger, 1853 in south-eastern tracts of Denmark, separated from the species' core distribution range in northern Germany by the inner Baltic Sea.

Like most of its congeners, the larvae of *Cheilosia fasciata* are phytophagous. However, while most – as far as their biology is known – are root or stem borers, *C. fasciata* lives as a solitary leaf miner on *Allium ursinum* L. (ramsons) (Fig. 1). This unique feeding habit corresponds to distinct morphological features of the larva, especially regarding the posterior respiratory process and

the anal segment (Rotheray 1990) (Fig. 2). The most similar species is *Cheilosia semifasciata* Becker, a leaf-miner of *Hylotelephium telephium* (L.) H. Ohba, with known occurrences throughout Central Europe and Fennoscandia, but not known from Denmark.

The biology of *C. fasciata* is well studied. In a series of publications, Klaus Hövemeyer (1987, 1992, 1995, 1996) investigated the biology and population dynamics of *C. fasciata*. He found that population growth was equally limited by three factors, namely weather conditions during the oviposition period, competition between older larvae and parasitization of pupae by *Phygadeuon ursini* Horstmann 1986 (Hymenoptera: Ichneumonidae). Also thanks to these detailed studies, the life cycle of the species is well known. For example, it has been established that females lay one egg only per leaf and that older larvae may abandon their native leaf when mined out and move to a neighbouring leaf. Pupation takes place in the mine and puparia remain there



Figure 1. Third instar larva of *Cheilosia fasciata* in upper surface blotch mine in a leaf of *Allium ursinum* L. (ramsons). Vålse Vesterskov 29-V-2014. Photo: HHB.

Mina i ovansidan av ett ramlöksblad; en nästan fullvuxen larv (tredje stadiet) kan skönjas genom bladets epidermis. Vålse Vesterskov 29-V-2014. Photo: HHB.

as the leaf wilts in early summer. Thus, overwintering takes place in leaf litter on the forest floor. There is one generation per year.

The distribution of *C. fasciata* extends from France and Benelux through all of Central Europe to Poland, Slovakia, Romania and the entire Balkan Peninsula. In addition, there is a rather local occurrence area around Bergen in western Norway (Nielsen 1979). In Norway, the species is listed as Near Threatened in the national Red Data Book (Artsdatabanken 2015). The syrphid species *Portevinia maculata* (Fallén, 1817) also uses *Allium ursinum* as a host; different parts of the plant, however. The larvae of that species start mining the petioles and later move down into the subterranean parts. Thus, the traces left by larvae are vastly different, and very easy to distinguish even for non-specialists. Similarly, the imagos of the two species are morphologically very distinct (Nielsen 2011) and even have somewhat different phenology, with *C. fasciata* flying from late April to late May and *P. maculata* somewhat later – from mid-May to late June.

Results

May 29, 2014, the first author came across small star-shaped mines and much larger silvery mines (Fig. 1) in leaves of *Allium ursinum* in the coastal beech forest Vålse Vesterskov on the

north-western corner of the island Falster in SE Denmark. Most of the mines contained a full-grown 3rd instar larva (Fig. 2), while some were vacated. From the appearance of mines and larvae, there was little doubt about the identity of the species. Dr. Klaus Hövemeyer confirmed the identification based on photographs.

The subsequent year, the second author visited the mentioned forest around the time of expected adult emergence. On 24 April, he was able to observe adult *C. fasciata* (five males and one female) and collect a few specimens (now deposited in the collections at ZMUC, Copenhagen, Denmark and MZLU, Lund Sweden) (Fig. 3). He also found the species in a nearby beech forest with a large population of the host plant, Alslev Skov (two males). Just before the end of the ramsons season, the first author searched for mines in several suitable forests. June 3, 2015, the species was found in Resle Skov and Vedby Vesterskov, again two coastal forests with large populations of the host plant. All the inhabited sites are within a limited area; the furthest sites being 10 km apart. They are all mature beech forest, managed for timber, but with long continuity in forest cover. Typical of the sites are forest fringes with tree-sized *Acer campestre* L. and copious old *Hedera helix* L., both indicative of mild winters, which result from the proxim-

ity to the Baltic Sea. All sites are shaded, mesic, mull-rich deciduous forest stands, i.e. the typical habitat of *A. ursinum* in the area.

Simultaneously with our own investigations, amateur naturalists were engaged via the citizen science web portal *fugleognatur*, where descriptions and photos of the species were put along instructions on how to make safe recordings of it. About a dozen suitable sites were searched for mines, all of which, however, were negative. Taken together, this effort enables the rendition of a preliminary presence-absence dotmap for the distribution of *C. fasciata* in Denmark (Fig. 4).

Discussion

Cheilosia fasciata is almost certainly a recent immigrant to Denmark, as it was not recorded in the Danish syrphid atlas (Torp 1994). The distance to nearest large *Allium ursinum* populations in Holstein, which constitutes the probable biotope for *C. fasciata* (Claußen 1980), is about 120 km, including 18 km of sea (the Fehmer



Figure 2. Detail of third instar larva of *Cheilosia fasciata* still in its mine, but with the upper leaf epidermis removed. The conspicuous posterior respiratory process is visible. Vålse Vesterskov 29-V-2014. Photo: HHB.

Detalj av larv i sin mina, dock med bladets epidermis borttagen. De bakre andningsöppningarna mynnar i ett gemensamt rör. Vålse Vesterskov 29-V-2014. Photo: HHB.

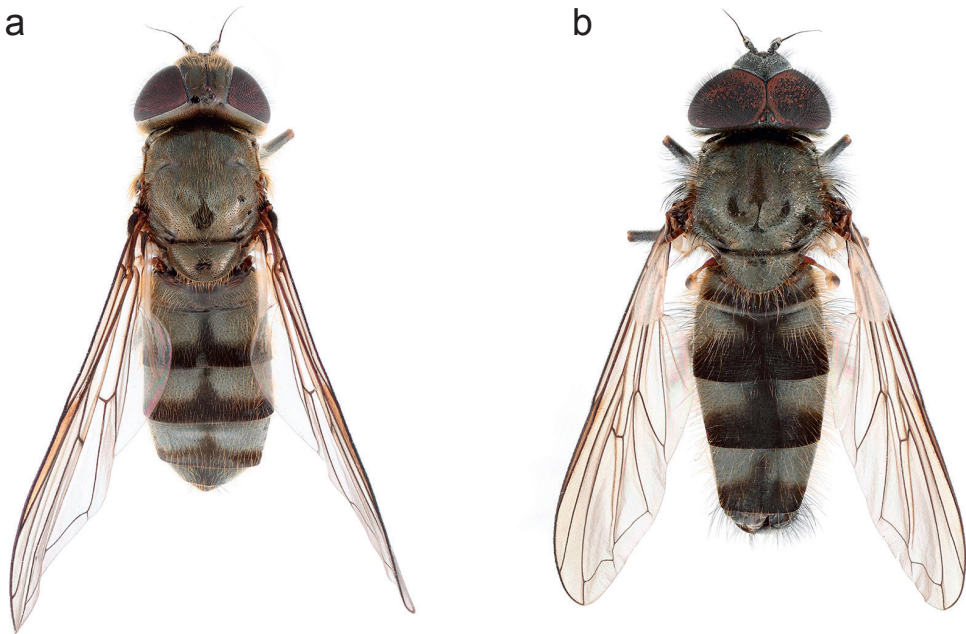


Figure 3. *Cheilosia fasciata*: – a) Female, – b) Male; both specimens from Vålse Vesterskov 24-IV-2015. Photo: Christoffer Fågerström.

Cheilosia fasciata: – a) Hona, – b) Hane; båda individerna funna i Vålse Vesterskov 24-IV-2015. Foto: Christoffer Fågerström.

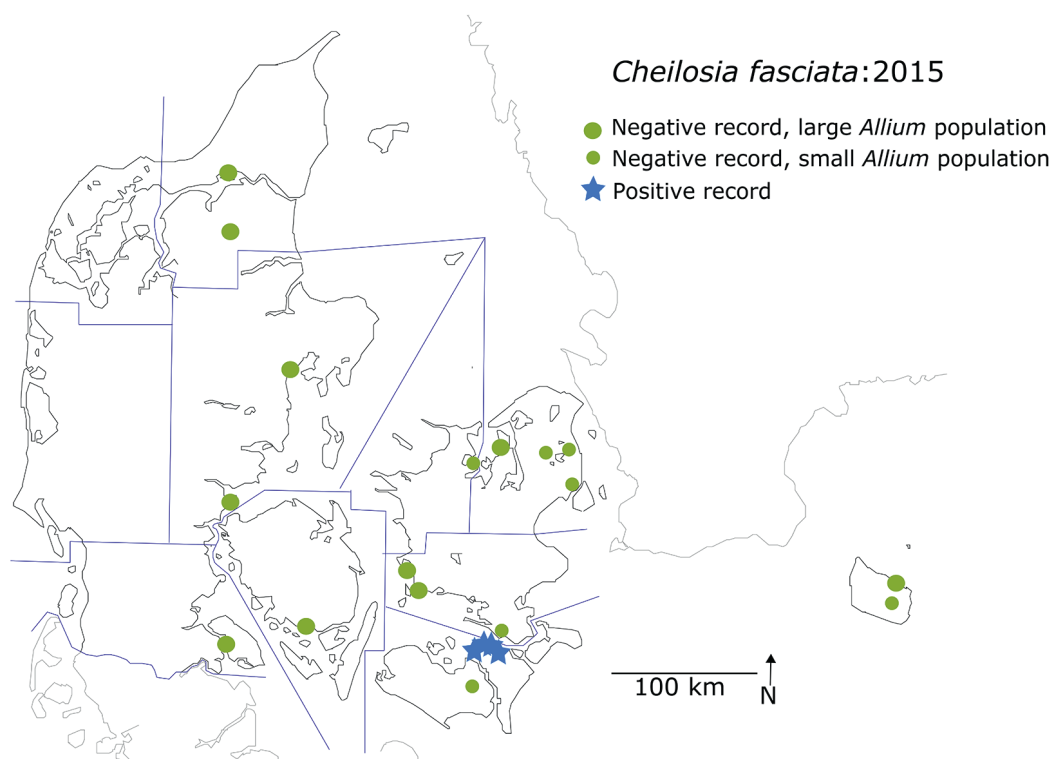


Figure 4. Distribution in Denmark of *Cheilosia fasciata* (blue stars), and indication of apparently suitable but unoccupied sites (green dots), divided into large and small habitat patches. Thin blue lines indicate faunistic districts.

Utbredning av *Cheilosia fasciata* i Danmark (blå stjärnor), samt platser med ramslök (gröna cirklar), där arten inte hittats trots eftersökning (storleken på cirkeln anger små och stora ramslökbestånd). Blå streck visar danska faunadistrikt.

Belt). This distance is not at all improbable for a chance long-distance dispersal event, e.g. carried by strong south-westerly wind during the adult flying time. However, haphazard human transport through movement of plants or soil over the said distance cannot be ruled out.

The phenology of the host plant demands emergence of the adult flies in early spring, when there is a substantial risk of cold spells. In Lower Saxony, cold and wet weather during the period of oviposition has been found to be a major limit to population growth (Hövmeyer 1992). Hence, the recent colonization of Falster is likely to have been made possible by a slight shift in mean spring temperature, or at least by a recent suite of years without cold spells during the critical time.

If indeed milder springs have enabled the described colonization, further spread of *C. fas-*

ciata to suitable sites in Denmark seems like a probable prediction. We propose this development be monitored. The conspicuous appearance of the mines towards the end of larval development, and the straightforward identification of the host plant, enables involvement of citizens in a surveillance programme.

Commercial harvest of young *Allium ursinum* leaves takes place in forests in the occurrence area of *C. fasciata* on the island of Falster. This activity poses a potential threat to the species' populations. The same might be the case in Scania, should the species continue to advance towards the northeast. We recommend that regional authorities issue management plans for sustainable harvest of *A. ursinum*, with due precaution for damage to populations of *C. fasciata* and *P. maculata*.

We encourage Swedish entomologists to

search for the species in southern Sweden, especially Scania, where apparently suitable *A. ursinum* stands may be found. The large silvery mines of the 3rd instar larvae – appearing in late May and early June – are very conspicuous and offer themselves as the most suitable phase of the life cycle to target in a systematic search effort. Confusion with the mainly subterranean tunnels of *P. maculata* is very unlikely once one has seen the photographs included in this article.

Acknowledgements

We thank Dr. Klaus Hövemeyer for confirming the identity of the larvae first found. We also thank the following persons for searching for mines and larvae in *Allium ursinum* populations: Aksel Jørgensen, Einar Flensted-Jensen, Erik Rald, Gunnar Knudsen, Ken Alminde, Klaus Thommesen, Klavs Nielsen, Ole Bidstrup, Poul Evald Hansen, Rasmus Bisschop-Larsen and Simon Haarder.

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Svensk sammanfattning

Blomflugan *Cheilosia fasciata* Schiner & Egger, 1853 är i Norden endast känd från Bergenstrakten i västra Norge. Här redovisas första danska fyndet av arten och dess nuvarande utbredning. Larven livnär sig i lätt igenkännbara minor i blad av ramslök (*Allium ursinum* L.). Vi hittade först arten på ön Falster under våren 2014. Under vår och sommar 2015 eftersöktes arten – framför allt av frivilliga – i skogar med ramslökbestånd i större delar av Danmark. Det resulterade i fynd av arten från ytterligare tre skogar inom kort avstånd av första fyndplatsen. I övriga landet var den frånvarande på lämpliga lokaler. Arten är troligen alldeles nyss invandrad och sannolikt under pågående spridning. Den kan möjligen dyka upp i Skåne inom ett antal år. Den fortsatta spridningen kommer att bli intressant att övervaka. Artens iögonfallande levnadssätt möjliggör medborgardeltagande.